

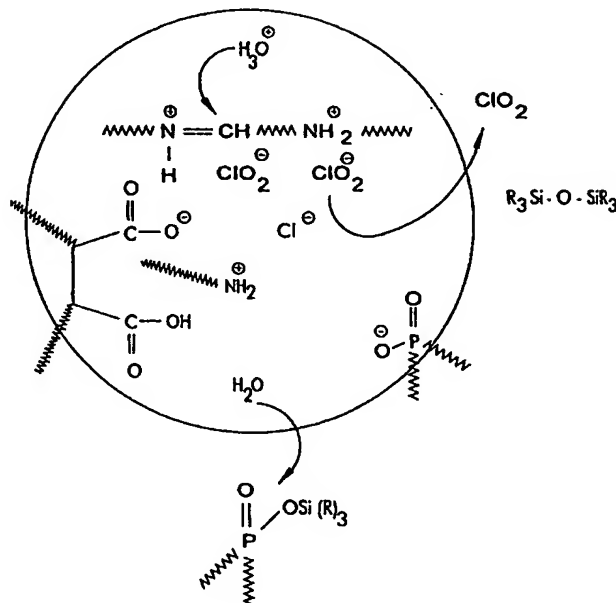
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US96/08724  <b>(22) International Filing Date:</b> 4 June 1996 (04.06.96)  <b>(30) Priority Data:</b> 08/465,086 5 June 1995 (05.06.95) US  <b>(71) Applicant:</b> SOUTHWEST RESEARCH INSTITUTE [US/US]; 6220 Culebra Road, San Antonio, TX 78228-0510 (US).  <b>(72) Inventors:</b> WELLINGHOFF, Stephen, T.; 6220 Culebra Road, San Antonio, TX 78228-0510 (US). KAMPA, Joel, J.; 6220 Culebra Road, San Antonio, TX 78228-00510 (US). BARLOW, Darren, E.; 6220 Culebra Road, San Antonio, TX 78228-0510 (US).  <b>(74) Agents:</b> SENNIGER, Stuart, N. et al.; Senniger, Powers, Leavitt and Roedel, 16th floor, One Metropolitan Square, St. Louis, MO 63102 (US).	<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>With amended claims.</i>  <b>Date of publication of the amended claims:</b> 16 January 1997 (16.01.97)	

(54) Title: POWDERED BIOCIDAL COMPOSITIONS



## (57) Abstract

A biocidal powder for sustained release of chlorine dioxide includes particles containing chlorite anions, and a hydrophobic core having the particles on a surface thereof, the hydrophobic core containing an acid releasing agent. The particles and the hydrophobic core are substantially free of water, and the particles are capable of releasing chlorine dioxide upon hydrolysis of the acid releasing agent.

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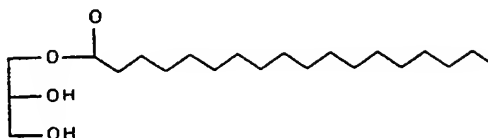
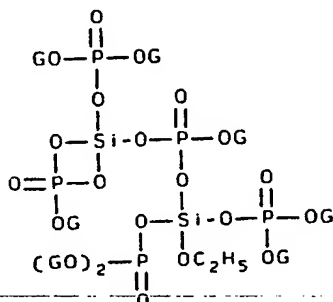
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## AMENDED CLAIMS

[received by the International Bureau on 10 December 1996 (10.12.96);  
original claims 1-13 replaced by amended claims 1-18 (4 pages)]

1. A biocidal and deodorizing powder for sustained release of chlorine dioxide comprising:  
particles containing chlorite anions; and  
a hydrophobic core having said particles on a  
5 surface thereof, the hydrophobic core containing an acid releasing agent, said particles and said hydrophobic core being substantially free of water, said particles being capable of releasing chlorine dioxide upon  
~~hydrolysis of the acid-releasing agent.~~
2. The powder of claim 1 further including anhydrous particles on the surface of the hydrophobic core.
3. The powder of claim 2 wherein the anhydrous particles comprise sodium sulfate, calcium sulfate, magnesium sulfate, or moisture depleted silica gel.
4. The powder of claim 1 wherein the particles contain an alkali metal chlorite or alkaline-earth metal chlorite; the hydrophobic core further comprises atactic  
5 polypropylene, hydrocarbon wax, chlorinated wax, polyethylene wax, polyolefin, polyester, a polyolefin copolymer, or mixtures thereof; and the acid releasing agent includes a carboxylic acid, an ester, an anhydride, an acyl halide, phosphoric acid, a phosphate ester, a trimethylsilyl phosphate ester, a dialkyl  
10 phosphate, sulfonic acid, a sulfonic acid ester, a sulfonic acid chloride, or a phosphosilane of a glycerol based ester.
5. The powder of claim 4 wherein the hydrophobic core comprises an acid releasing wax.
6. The powder of claim 5 wherein the acid releasing wax is a phosphosilane of a glycerol based ester.

7. The powder of claim 6 wherein the acid releasing wax has the formula



wherein G has the formula

8. The powder of claim 1 wherein the particles contain an alkali metal chlorite, alkaline-earth metal chlorite, or a chlorite salt of a transition metal ion or a protonated primary, secondary, tertiary or quaternary amine.
9. The powder of claim 8 wherein the particles contain sodium chlorite, calcium chlorite or potassium chlorite.
10. The powder of claim 1 wherein the hydrophobic core further comprises atactic polypropylene, hydrocarbon wax, chlorinated wax, polyethylene wax, a low molecular weight polyolefin, polyester, a polyolefin copolymer, or mixtures thereof.
11. The powder of claim 1 wherein the acid releasing agent includes a carboxylic acid, an ester, an anhydride, an acyl halide, phosphoric acid, a phosphate ester, a trimethylsilyl phosphate ester, a dialkyl phosphate, sulfonic acid, a sulfonic acid ester, a

sulfonic acid chloride, a phosphosilicate, or a phosphosilane of a glycerol based ester.

12. A process for preparing a powder providing sustained release of chlorine dioxide, the process comprising:

5       forming particles containing chlorite anions; and  
      spraying a hydrophobic material containing an acid releasing agent onto a fluidized bed of the particles so  
~~as to form a powder having a core containing the~~  
      hydrophobic material and a layer of the particles containing chlorite anions on a surface of the core.

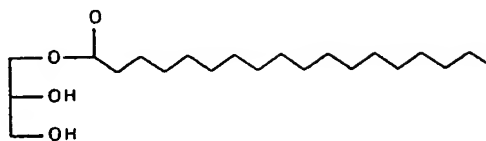
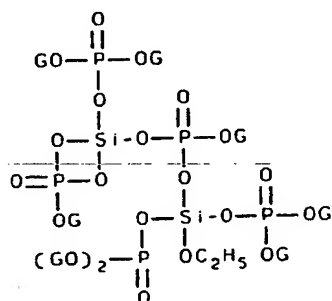
13. The process of claim 12 wherein the fluidized bed includes anhydrous particles such that the layer of particles on the surface of the hydrophobic core includes the anhydrous particles.

14. The process of claim 13 wherein the anhydrous particles comprise sodium sulfate, calcium sulfate, magnesium sulfate, or moisture depleted silica gel.

15. The process of claim 12 wherein the particles contain an alkali metal chlorite or alkaline-earth metal chlorite; the hydrophobic phase further comprises  
5       atactic polypropylene, hydrocarbon wax, chlorinated wax, polyethylene wax, polyolefin, polyester, a polyolefin copolymer, or mixtures thereof; and the acid releasing agent includes a carboxylic acid, an ester, an anhydride, an acyl halide, phosphoric acid, a phosphate ester, a trimethylsilyl phosphate ester, a dialkyl  
10       phosphate, sulfonic acid, a sulfonic acid ester, a sulfonic acid chloride, or a phosphosilane of a glycerol based ester.

16. The process of claim 15 wherein the acid releasing agent comprises an acid releasing wax.

17. The process of claim 16 wherein the acid releasing wax has the formula



wherein G has the formula

18. A method of retarding bacterial, fungal, and viral contamination and growth of molds on a surface and/or deodorizing the surface comprising:

5 exposing the surface to a powder that does not release chlorine dioxide in the absence of moisture, the powder having a hydrophobic core containing an acid releasing agent and having chlorite anions on a surface thereof; and

10 exposing the surface to moisture to release chlorine dioxide from the powder into the atmosphere surrounding the surface.